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Process for reducing the damage susceptibility in optical quality crystals

Description of Technology: This invention relates to a process for reducing the damage susceptibility of optically useful crystals of KTiOPO.sub.4 and certain of its analogs.

Patent Listing:

1. **US Patent No. 5,411,723,** May 2, 1995, "Process for reducing the damage susceptibility in optical quality crystals."

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=5,411,723.PN.&OS=PN/5,411,723&RS=PN/5,411,723

Market Potential:
A desire for larger crystal size, better quality and greater durability, i.e., lower susceptibility to damage, as well as the disadvantages of hydrothermal processes have led to continued interest in flux growth techniques and to the development of a variety of flux processes. In U.S. Pat. No. 4,231,838 crystal growth is carried out by heating certain mixtures of MTiOXO4 with a nonaqueous flux M/X/O (where M is selected from K, Tl, and Rb and X is selected from P and As) or their precursors to produce a nonaqueous melt. More recently, U.S. Pat. No. 5,084,206 discloses a flux method using selected dopants to produce crystals having lowered ionic conductivity, a feature desired for many applications.

While the crystals produced by the known flux processes can have high optical quality, the rigors of certain optical applications, require high resistance to optical damage or lower susceptibility to optical damage than exhibited by most flux produced crystals, i.e., 10 GW/cm.sup.2.

It has been found that such crystals of MTiOXO.sub.4, particularly when flux grown, have vacant M and vacant O sites in the crystal lattice. While this invention is not bound by any theory or explanation of operation, it is believed to be those imperfections that cause the susceptibility optical damage, especially when the crystal is flux grown. Optical damage in such crystals can be electric field-induced and/or optical radiation-induced (e.g., laser-induced).

The process of this invention treats crystals of MTiOXO.sub.4 which have crystal structure deficiencies of M and O by heating them in the presence of a mixture of MTiOXO.sub.4 and at least one inorganic compound of Rb.sup.+ K.sup.+, Cs.sup.+ and/or T1.sup.+ at a treatment temperature of from about 400.degree. C. to 950.degree. C. and a pressure of at least 14 psi and in the presence of a gaseous source of oxygen for a time sufficient to decrease the optical damage susceptibility of the crystal.

Benefits:

- Treats crystals that have structural deficiencies.
- Decrease optical damage susceptibility of crystals.

Applications

- Optics

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